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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/516,328 03/01/00 PREVEY III

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EXAMINER

P	IRI-003PAT
ART UNIT	PAPER NUMBER

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3726

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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.
09/516,328

Applicant(s)
Prevey III

Examiner
Eric Compton

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Aug 23, 2001
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above, claim(s) 20-25 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirements.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- a) ☐ All b) ☐ Some* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

- 15) ☐ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____
- 18) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other: _____

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DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 16-19 are rejected under 35 U.S.C. 102(b) as being anticipated by US Patent 5,826,453 to Prevey, III.

Regarding claim 16, Prevey, III discloses an apparatus (100) for inducing compressive stress in the surface of a part comprising: a burnishing member (114); a socket (108) having an inner chamber (134) and a seat (110) for receiving the burnishing member; means for applying force (180) against the burnishing member for exerting pressure against the surface of the part (138); means for providing constant volume to the fluid to the inner chamber (an external fluid supply); wherein the socket provides clearance between the seat and the burnishing member for permitting fluid to pass.

Regarding claim 17, Prevey III, discloses that "By further adjusting the fluid pressure, a desired amount of lubrication fluid will penetrate around the burnishing ball 114 and flow out through the fluid channels 148 in the retaining edge 146 to be transferred onto the surface 178 of the workpiece 144 to provide the desired lubrication and cooling for the burnishing operation.

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The proper pressure or compressive force to be applied to the surface 178 of the workpiece 144 during the burnishing operation is provided by carefully tightening or loosening the adjustment screw 162” (col 6, lines 37-46). “Accordingly, the pressure of the compressive force exerted by the burnishing ball 114 can be precisely regulated” (col 6, lines 56-58). It is inherent that some means is provided for monitoring and adjusting the fluid pressure from the external surface, such that the compressive force can be precisely regulated.

Regarding claims 18 and 19, Prevey, III, further discloses that, “The burnish operation is then controlled by a conventional electronic control unit, not shown, which controls the movement of the workpieces or the movement of the burnishing head. In another preferred embodiment of the invention as shown in FIG. 4, the adjustment screw is replaced by a follower rod 180 of a cylinder piston assembly 182. By moving the follower rod 180 inwardly or outwardly, the spring tension is correspondingly increased or decreased and pressure or compressive force applied by the burnishing ball 114 to the surface 178 of the workpieces is correspondingly adjusted” (col 6-7, lines 59-3).

Note: regarding claims 16-19, it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ2d 1647 (1987).

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Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 5,826,453 to Prevey, III, in view of JP 62-292,362 to Yonezama et al (KOBE STEEL LTD).

Regarding claims 1, and 11, Prevey, III discloses a method of inducing a layer of compressive stress in the surface of a part comprising:

1. defining a surface area for receiving compressive stress (see claim 1, first limitation).
2. selecting the magnitude of the compression and residual stress distribution to be induced in the surface of the selected region (see stress distribution and % cold work, in Figures 5-7, and col 6-7, lines 63-3);
3. exerting pressure against the surface of the selected region, the pressure being applied on a selected pattern along the surface to form zones of deformation having a deep layer of compressive stress; (see claim 2, second limitation).
4. "The burnish operation is then controlled by a *conventional electronic control unit*, not shown, which controls the movement of the workpieces or the movement of the burnishing head. In another preferred embodiment of the invention as shown in FIG. 4, the adjustment screw is replaced by a follower rod 180 of a cylinder piston assembly 182. By moving the follower rod

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180 inwardly or outwardly, the spring tension is correspondingly increased or decreased and pressure or compressive force applied by the burnishing ball 114 to the surface 178 of the workpieces is correspondingly adjusted” (col 6-7, lines 59-3). This can be considered varying the the pressure exerted against the surface to produce a desired stress distribution and magnitude of compression within the surface. Programming the control unit is noted in col 3, first paragraph.

However, when the apparatus and method of Prevey, III, is clearly capable of inducing compression and residual stress at particular points along the surface of the selected region by varying the pressure being exerted against the surface to produce a desired stress distribution and magnitude of compression along the surface, it is not explicitly disclosed.

Yonezama et al disclose a burnishing process. “When processing begins [sic], a curved surface roller 5 is first set at point A, a pressure is gradually increased to point B by means of pressure control with a sequencer, kept constant to point B to point C, and gradually lowered from point C to point D reversely” (English Abstract). Figure 1 shows the stress distribution being exerted along the surface of the workpiece.

Regarding claim 1 and 11, it would have been obvious to one of ordinary skill in the art, at the time of invention, to have varied the pressure being exerted against the surface to produce a desired stress distribution and magnitude of compression at particular points along the surface using the method and apparatus of Prevey, III, in light of the teachings of Yonezama et al, in order to burnish a part having different stress distribution requirements.

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Regarding claim 2, as shown in Figure 1 of Prevey, III, the pressure being exerted against the surface of the part is performed by a burnishing operation.

Regarding claims 3-4 and 12-13, Prevey, III, discloses, "it has been unexpectedly found that by cold working the surface less than about 3.5%, and preferably less than about 2.0%, results in longer retention of compressive residual stress at elevated temperatures, less rapid relaxation under cyclic loading and minimizes the alteration of the residual stress field during tensile or compressive overload than conventional cold working and surface hardening processes" (col 7, lines 37-45).

Regarding claims 5, and 14, Prevey, III, further discloses that, "The burnish operation is then controlled by a conventional electronic control unit, not shown, which controls the movement of the workpieces or the movement of the burnishing head. In another preferred embodiment of the invention as shown in FIG. 4, the adjustment screw is replaced by a follower rod 180 of a cylinder piston assembly 182. By moving the follower rod 180 inwardly or outwardly, the spring tension is correspondingly increased or decreased and pressure or compressive force applied by the burnishing ball 114 to the surface 178 of the workpieces is correspondingly adjusted" (col 6-7, lines 59-3).

Regarding claim 6, Prevey, III discloses that "The burnishing means is then passed in a predetermined pattern across the area to be burnished such that zones of deformation formed by each pass of the burnishing means do not overlap" (col 5, lines 4-7). The method is to be used for burnishing complex curved surfaces. Therefore spacing will have to change accordingly as the

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slope gradient of the surface changes, as in the case of a curved surface having a non-linear profile.

Regarding claim 7, Prevey III, discloses that “By further adjusting the fluid pressure, a desired amount of lubrication fluid will penetrate around the burnishing ball 114 and flow out through the fluid channels 148 in the retaining edge 146 to be transferred onto the surface 178 of the workpiece 144 to provide the desired lubrication and cooling for the burnishing operation. The proper pressure or compressive force to be applied to the surface 178 of the workpiece 144 during the burnishing operation is provided by carefully tightening or loosening the adjustment screw 162” (col 6, lines 37-46). “Accordingly, the pressure of the compressive force exerted by the burnishing ball 114 can be precisely regulated” (col 6, lines 56-58). It is inherent that some means is provided for monitoring and adjusting the fluid pressure from the external surface, such that the compressive force can be precisely regulated.

Regarding claim 8, as shown in Figure 5a of Prevey, III, with respect to single point burnishing, a more shallow layer of compressive stress is induced within the surface (at a depth of 1.0 mm) of the part than near the surface (at a depth of 0.25 mm) of the part.

Regarding claim 9, Official Notice, is taken that polishing or buffing a workpieces removes a layer of material along the surface of a material. It is also known that polishing and buffing can refine the surface of a workpiece and reduce surface stress levels. Therefore, it would have been obvious to one of ordinary skill in the art, at the time of invention, to have polished the

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workpiece of Prevey, III, in order to remove a layer of material along the surface, in order to reduce surface stress levels in a workpiece.

Regarding claim 10, Prevey III, discloses implementing the burnishing process on complex work surfaces such as found on dovetail slots for turbine or compressor disk used in turbo machinery (col 8, lines 4-8).

Regarding claim 15, Prevey, III, discloses that "It has been unexpectedly found that the single-point burnishing method, applied in a single pass, *or multiple passes of reduced compressive force*, is effective for producing compressive residual stresses following tensile deformation of the surface to produce deep compression with minimal cold working" (col 5, lines 7-12).

Prior Art References

5. The prior art references listed on the enclosed PTO-892, but not used in a rejection of the claims, are cited for their teachings of burnishing methods.

F.R. 2662263 to Gabriel et al, also discloses a method of burnishing wherein the pressure is varied along the surface of the workpiece.

EP 0041248 disclose a method of burnishing. "The tool is located on the piston rod (I) of a hydraulic cylinder used to press the tool against the rollers. The travel of rod (I) is fed into a

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computer, which also receives a signal representing the fundamental desired rolling pressure (Sk), which is fed to the comparator. The comparator output is used in a hydraulic circuit so pressure (Sa) is kept at the corrected value (Sk)" (English Abstract). See also the information in the Embodiment Section.

Response to Arguments

6. Applicant's arguments filed August 23, 2001, have been fully considered but they are not persuasive.

Applicants primary argument is that the prior art, mainly Prevey III, does not disclose selecting the magnitude of compression and the residual stress distribution to be induced at particular points along the surface of a region nor varying the pressure and the rate of pressure variation being exerted.

Regarding these issues, Prevey, III, discloses "In another preferred embodiment of the invention as shown in FIG. 4, the adjustment screw is replaced by a follower rod 180 of a cylinder piston assembly 192. ***By moving the follower rod 180 inwardly or outwardly the spring tension is correspondingly increased or decreased and pressure or compressive force applied by the burnishing ball 114 to the surface of the workpiece is correspondingly adjusted***" (col 6-7, lines 63-3). Therefore, the apparatus of Prevey III is quite capable of meeting these limitation yet it not explicitly disclosed as such.

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The Examiner has previously pointed out the reference to Yonezama et al, which discloses a method for burnishing comprising selecting the magnitude of pressure, which results in the compression and the residual stress distribution to be induced, along the surface of a selected region. In this case the selected region is a portion of a crank shaft as shown in Figure 5. Regardless of the means used for varying the pressure, the reference nonetheless disclosed the step of varying the pressure along a selected region of the part. The pressure is clearly varied along the surface of this part as previously pointed out. Therefore, it would have been obvious to have varied the pressure being exerted against the surface to produce a desired stress distribution and magnitude of compression at particular points along the surface using the method and apparatus of Prevey, III, in light of the teachings of Yonezama et al, in order to burnish a part having different stress distribution requirements.

Regarding the specific of the apparatus (claims 16-19), Figure 11 of the present application is directed at essentially the same apparatus as disclosed in Prevey, III, including a spring means (140) and therefore, the spring appears to function in the same way to absorb surface variations (pages 18-19, lines 21-8). Furthermore, in Prevey, III, the adjustment screw is only one embodiment, a piston assembly is also disclosed. It is this piston assembly that is apparently the same as the one in the present application.

Applicant's arguments with respect to these issues is not as issue as it clearly discussed by the prior art. The other references are noted for additional teachings, as well. Therefore, the rejections above are valid.

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Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Contact Information

8. Official documents related to the instant application may be submitted to the Technology Center 3700 mail center by facsimile at (703) 305-3579/3580. Should Applicant desire to submit a DRAFT response to the Examiner by facsimile transmission, then Applicant should contact the Examiner at the number below for instructions concerning the transmission of DRAFT documents. Applicant is reminded to clearly mark any facsimile transmission as "DRAFT" if it is not to be considered as an official response.

9. Any inquiry concerning this communication should be directed to Examiner Eric Compton at telephone number (703) 305-0240.

ebc

October 3, 2001



DAVID P. BRYANT
PRIMARY EXAMINER